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09/801,630	03/08/2001	Kars-Michiel Hubert Lenssen	NL 000094	8319

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EXAMINER

DOLAN, JENNIFER M

ART UNIT PAPER NUMBER

2813

DATE MAILED: 08/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/801,630

Applicant(s)

LENSSEN, KARS-MICHIEL  
HUBERT

Examiner

Jennifer M. Dolan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 July 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 6-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

*This action is in response to the RCE and Request for Reconsideration, filed on 7/28/03 and 5/29/03, respectively.*

#### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/29/03 has been entered.

#### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

3. Claims 1-4, 6-8, and 13-15 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No 6,175,475 to Lin et al.

Regarding claims 1, 13, and 15 Lin discloses a data storage system (column 1, lines 12 – 19) comprising a set of structures (figure 4) including: a first structure of layers (430, 420, 415,

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410) including at least a first ferromagnetic layer (420) and a second ferromagnetic layer (410) with at least a separation layer of a non-magnetic material therebetween (415; figure 4), the first structure having at least a magnetoresistance effect (column 1, line 41 – column 2, line 3); a second structure (406 and 432) including at least one magnetic layer (406 and 432), the second structure influencing at least one intrinsic magnetic characteristic of the first structure (bias field/magnetic moment, column 3, lines 15 – 27); and the second structure being separated from the first structure by at least a spacer layer (408), wherein the non-magnetic material is a metal (column 5, lines 12 – 14) and the spacer layer comprises a high-resistive metallic material (column 5, lines 17 – 23). It is inherent that the spacer layer causes a mainly ferromagnetic coupling of the second structure on the first structure while not substantially influencing the magnitude of the magnetoresistance effect of the first structure, because the Ta layer separating the first and second structures is sufficiently thin (5 nm from column 5, lines 17 – 19) for ferromagnetic coupling to be the dominant coupling mechanism between the two layers, and because the Ta layer has sufficiently high resistivity to prevent the second structure from influencing the magnetoresistance of the first structure. Regarding claim 15, it is an inherent property of the sensor of Lin that ‘a magnetoresistance characteristic *can* be tuned’ by adjusting a thickness of the high-resistive metallic material.

Regarding claim 2, Lin discloses that the second structure comprises at least one layer (432) of a magnetic material of a high coercivity.

Regarding claim 3, Lin discloses that the second structure comprises at least one layer (432) of an exchange biasing material.

Regarding claim 4, Lin discloses that the second structure comprises a layer (406, 432) that has a magnetization direction that is substantially anti-parallel with respect to the magnetization direction of the first ferromagnetic layer (column 3, lines 15 – 18).

Regarding claims 6 and 14, Lin discloses that the high-resistive metallic material is Ta (column 5, lines 17-18), which inherently induces a crystallographic characteristic on layers deposited upon it (column 4, lines 63 – 67), in this case, the second structure.

Regarding claim 7, Lin discloses that the high resistive metallic material is Ta (column 5, lines 17 – 18).

Regarding claim 8, Lin discloses that the high-resistive metallic material has a thickness of 5 nm (column 5, lines 16 – 19), which is in the range of one atomic layer up to 15 nm.

4. Claim 16 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No 6,127,053 to Lin et al.

Lin discloses a magnetic system such as a data storage system or a sensing system of a magnetic characteristic (column 1, lines 8 – 11), the system comprising a set of structures (figure 8) including: a first structure of layers including at least a first ferromagnetic layer structure (420) and a second ferromagnetic layer (410) with at least a separation layer of a non-magnetic material therebetween (415), the first structure having at least a magnetoresistance effect (column 1, line 53 – column 2, line 13); a second structure including at least one magnetic layer (406), the second structure influencing at least one intrinsic magnetic characteristic of the first structure (column 2, lines 19 – 29); the second structure being separated from the first structure by at least a spacer layer (408) of a high-resistivity metallic material (column 7, lines 26 – 27)

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furthermore influencing the coupling of the second structure on the first structure while not substantially influencing the magnitude of the magnetoresistance effect of the first structure (column 6, lines 39 – 50; column 2, lines 19-29; also, it is inherently the case that the second structure will not substantially influence the MR effect of the first structure, since the Ta spacer only allows the second structure to weakly couple to the first structure). Lin further discloses that the first ferromagnetic layer structure can comprise 2 non-abutting ferromagnetic layers (column 11, lines 60 – 61 and figure 7b and 8), while the second structure comprises 1 ferromagnetic layer (406). Thus, Lin discloses that the first ferromagnetic layer structure and second structure respectively comprise an even number of non-abutting ferromagnetic layers and an odd number of non-abutting ferromagnetic layers.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. '475 in view of U.S. Patent No. 6,166,539 to Dahlberg et al.

Lin discloses that the layer of high-resistive material is made of Ta, Al<sub>2</sub>O<sub>3</sub> or SiO<sub>2</sub> (column 5, lines 17 – 18 and column 6, lines 26 – 28).

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Lin fails to disclose a metallic polymer with a conductivity in the range of the conductivities of the group of Ti, Zr, Hf, etc.

Dahlberg discloses that polyimide can be used in place of  $\text{Al}_2\text{O}_3$  or  $\text{SiO}_2$  in a magnetic head (column 16, lines 42 – 43).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the layer of high-resistive material of Lin with a polymer, as taught by Dahlberg. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to substitute the polymer for the high-resistive material, because Dahlberg shows that they can be used interchangeably.

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. '475 in view of U.S. Patent No. 6,178,072 to Gill.

Lin discloses that the second structure is separated from the first structure by a layer selected from a group including high-resistive metallic materials (Ta) and insulating layers ( $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ) (column 5, lines 17 – 18 and column 6, lines 26 – 28).

Lin fails to disclose that the spacer comprises a layer of a high-resistive metallic material and an insulating layer abutting the high-resistive layer.

Gill discloses a spacer comprising a layer of high-resistive metallic material (308) and an insulating layer (306) abutting the layer of high-resistive metallic material.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetoresistive structure of Lin, so that the spacer includes the high-resistivity material abutting an insulating layer, as taught by Gill. The rationale is as follows:

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One of ordinary skill in the art at the time the invention was made would have been motivated to provide an insulating layer abutting a high-resistivity layer, in order to prevent shunting of the magnetoresistive sense current of the first structure through the second structure. This allows the second structure to be designed in such a way that read signal symmetry and greater thermal stability are achieved (Gill, column 3, lines 15 – 24).

8. Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. '475 in view of U.S. Patent No. 6,114,719 to Dill et al.

Regarding claim 9, Lin discloses a spacer layer made of a Ta, which is a high-resistive metallic material (column 5, lines 17 – 18).

Lin fails to disclose that the high-resistive metallic material is made of Cr, Mo, or W.

Dill discloses a nonmagnetic spacer layer made of Cr (column 7, lines 4-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the spacer layer of Lin so that it is made of Cr, as taught by Dill. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to use Cr for the spacer layer, since it is a recognized art equivalent to Ta as a nonmagnetic high-resistivity spacer material (Dill, column 7, lines 5-7), and thus Cr and Ta can be used interchangeably in this capacity.

Regarding claim 12, Lin teaches a magnetoresistive read sensor, but fails to disclose a magnetic memory structure.

Dill discloses a magnetic memory structure (column 1, lines 45 – 50).



It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetoresistive structure of Lin so that it can be used in memory structures, as taught by Dill. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to use the magnetoresistive structure in a memory structure, because equivalent structures can be used for both solid state memory and external magnetic field read sensors (Dill, column 1, lines 45 – 50). Thus, it is well within the purview of a person having ordinary skill in the art to use a magnetoresistive sensing structure in either a memory structure or a magnetoresistive read head.

### ***Response to Arguments***

9. Applicant's arguments filed 5/29/03 have been fully considered but they are not persuasive.

First, the Applicant argues that the applied references, in particular Lin '475, fail to disclose each feature of the claims, and that the reliance upon 'inherency' arguments is improper. The Applicant argues that Lin '475 fails to teach that the spacer layer comprises a high-resistive metallic material, where the spacer layer causes a mainly ferromagnetic coupling of the second structure on the first structure while not substantially influencing the magnitude of the magnetoresistive effect of the first layer. Lin '475, in contrast to this, teaches that the spacer layer provides magnetic isolation. The Examiner fails to provide evidence that the spacer layer of 'Lin causes a mainly ferromagnetic coupling, and that the examiner improperly uses the teachings of the present invention to support the arguments of inherency, rather than relying on the teachings of Lin '475, itself.

This is not persuasive, however, because the Examiner is still convinced that a materially identical structure as that taught in the present application will have the same properties as the properties of the present application. A mainly ferromagnetic coupling between a first and second structure is expected for a layer structure consisting of a stacked pinned layer, spacer, free layer, 2-15 nm thick Ta layer, pinned layer, and AFM layer in order, as is explained in pages 4-6 and 14 of the present application, as well as figures 1-2. It does not matter whether Lin '475 explicitly teaches of an 'orange-peel' ferromagnetic coupling between the two structures, an influencing of the magnetic characteristics of the first structure based on the second structure, or the ability to 'tune' a magnetic characteristic of one structure based on the other. Because both Lin '475 and the Applicant disclose structures consisting of (in stacked order): AFM / pinned layer / spacer layer / free layer / 2-15 nm Ta /pinned layer / AFM, the structures taught by both Lin '475 and the Applicant must inherently have the same properties.

Section 2112 of the MPEP supports the rejections applied in the prior office actions, and the lack of a need for Lin '475 to explicitly express the ferromagnetic coupling properties, by stating, 'The claiming of a new use, new function or unknown property which is inherently present in the prior art does not necessarily make the claim patentable. In re Best, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977). See also MPEP § 2112.01 with regard to inherency and product-by-process claims and MPEP § 2141.02 with regard to inherency and rejections under 35 U.S.C. 103,' and also 'Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection. "There is nothing

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inconsistent in concurrent rejections for obviousness under 35 U.S.C. 103 and for anticipation under 35 U.S.C. 102.” In re Best, 562 F.2d 1252, 1255 n.4, 195 USPQ 430, 433 n.4 (CCPA 1977). This same rationale should also apply to product, apparatus, and process claims claimed in terms of function, property or characteristic. Therefore, a 35 U.S.C. 102/103 rejection is appropriate for these types of claims as well as for composition claims.’

Additionally, regarding claim 14, Lin ‘475 discloses that Ta is defined between the second and first structures. Ta is a material which inherently and automatically induces a texture upon overlying layers, as is noted in column 4, lines 63-67 of Lin ‘475, and on page 14 of the present application. Since it is the patentability of the product that is being examined, rather than observed properties of a structure, and since Lin discloses a structure/product substantially identical to that of the applicant, the structure of Lin ‘475 must inherently have the claimed properties, regardless of whether they are explicitly discussed in Lin ‘475, or whether they are observed at all by Lin ‘475.

If the invention of Lin ‘475 in fact does not have the claimed properties (i.e., the 'orange peel' ferromagnetic coupling of the present application is not based upon the layer structure), then the present application is not enabling, since there is no explanation in the present application of what treatments or changes have been enacted on the free magnetic layer, Ta spacer layer, and second structure of the present application, in order to cause the claimed ferromagnetic coupling. As it is presently understood from the disclosure of the present application, microwaviness of the magnetic layers is expected to be present for any soft ferromagnetic layers, and separating two soft ferromagnetic layers by 2-15 nm of Ta will automatically cause ferromagnetic 'orange peel' coupling between the two layers.

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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (703) 305-3233.

The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (703) 308-4940. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Jennifer M. Dolan  
Examiner  
Art Unit 2813

jmd

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
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